

What is claimed is:

1. A composition for electrophoretic deposition of a protective coating, said composition comprising:
  - 5 a cationic resin emulsion; and
  - a curative mixed with said cationic resin emulsion, said composition after electrophoretic deposition and curing providing said protective coating having a concentration of extractable ionic contaminants less than about 200 nanograms/cm<sup>2</sup>; and a concentration of labile components less than about 36,000 nanograms/cm<sup>2</sup>.
- 10 2. The composition of claim 1, wherein said cationic resin comprises an epoxy-based polymer.
- 15 3. The composition of claim 2, wherein said epoxy-based polymer is a reaction product of a bis-phenol A containing moiety and a substituted fluorene monomer selected from the group consisting of fluorene bis-phenol, bis-cresol fluorene, bis-N-methylaminophenyl fluorene and bis-glycidoxyl phenyl fluorene or combinations thereof.
- 20 4. The composition of claim 1, wherein said curative comprises a bismaleimide derivative.
5. The composition of claim 4, wherein said bismaleimide derivative includes the reaction product of maleic anhydride and a diamine selected from the group consisting of aliphatic diamines, aromatic diamines and alicyclic diamines.
- 25 6. The composition of claim 1, further including a polymerizable monomer and photoinitiator to provide a photosensitive composition.
7. The composition of claim 6, wherein said polymerizable monomer is selected from the group consisting of pentaerythritol triacrylate and pentaerythritol tetraacrylate.

8. The composition of claim 6, wherein said photoinitiator is t-butyl anthraquinone.

9. A flexible printed circuit comprising:

a film substrate;

5 a plurality of conductive traces adjacent to a surface of said film substrate;

and

an insulating coating deposited on said plurality of conductive traces using  
electrodeposition techniques, said insulating coating comprising a cured polymer  
composition having a concentration of extractable ionic contaminants less than about 200  
10 nanograms/cm<sup>2</sup>; and a concentration of labile components less than about 36,000  
nanograms/cm<sup>2</sup>, said flexible printed circuit having a bend radius below 3.0mm without  
damage to said insulating coating.

10. The flexible circuit of claim 9, wherein said cured polymer composition allows  
formation of a through - soldered connection to at least one of said plurality of  
conductive traces.

11. A flexible circuit according to claim 9, wherein said cured polymer comprises a  
polyepoxy-based polymer.

20 12. The flexible circuit of claim 11, wherein said polyepoxy-based polymer is a  
reaction product of a bis-phenol A containing moiety and a substituted fluorene monomer  
selected from the group consisting of fluorene bis-phenol, bis-cresol fluorene, bis-N-  
methylaminophenyl fluorene and bis-glycidoxyl phenyl fluorene or combinations thereof.

25 13. The flexible circuit of claim 9, wherein said flexible circuit is a flat circuit,  
substantially free from curl.

14. The flexible circuit of claim 9, wherein said cured polymer forms by heating.

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15. The flexible circuit of claim 14, wherein said cured polymer forms by heating said insulating coating in a temperature range from about 100°C to about 350°C.

16. The flexible circuit of claim 9, wherein said cured polymer forms under the  
5 influence of radiant energy.

17. The flexible circuit of claim 16, wherein said radiant energy is ultraviolet radiation.

10 18. A method for forming an insulating coating on conductors of a flexible circuit, said method comprising the steps of:

providing a flexible circuit including at least one of said conductors;

connecting said at least one conductor to a DC power supply such that said at least one conductor becomes a negatively charged conductor;

15 immersing said negatively charged conductor in a composition comprising:

a cationic resin emulsion; and

a curative mixed with said cationic resin emulsion;

passing current through said negatively charged conductor for electrophoretic deposition of a deposited composition on the surface of said at least one conductor; and

20 curing said deposited composition to provide said insulating coating having a concentration of extractable ionic contaminants less than about 200 nanograms/cm<sup>2</sup>; and a concentration of labile components less than about 36,000 nanograms/cm<sup>2</sup>.

19. The method of claim 18, wherein said curing said deposited composition further  
25 includes crosslinking said deposited composition to a partially cured composition that allows through-soldering connection to said at least one conductor.

20. The method of claim 18, wherein said curing of said deposited composition uses a form of energy selected from the group consisting of thermal energy and radiant energy  
30 and combinations thereof.